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SUMMARY

In **Chapter 1**, the importance of facial trauma as a public health problem is explained. Facial trauma constitutes a substantial portion of emergent admissions to maxillofacial surgery services. Safety restraint devices—specifically, the combined use of airbags and seat belts—have decreased the incidence of severe and panfacial fractures. Subsequently, interpersonal violence is increasingly being seen as the cause of facial fractures. The optimal management of these injuries is contingent on the understanding of several topics within the field. Facial trauma is a huge public health problem because of the significant negative impact on an individual's overall physical and psychological health and also because of the associated socioeconomic consequences that cannot be ignored. The cost of treatment and admission to hospital, the use of hospital resources, and finally the macroeconomic loss of revenue can be significant after such injuries.

Chapter 2 is focused on the epidemiology of facial trauma that may vary widely across countries (and even within the same country), and is dependent on several cultural and socioeconomic factors. A systematic review of the papers about the epidemiology of maxillofacial trauma that were published between January 1980 and December 2013 is described following the identification of 69 studies from Africa (n=9), North America and Brazil (n=6), Asia (n=36), Europe (n=16), and Oceania (n=2). In all the studies men outnumbered women, the ratio usually being more than 2:1. In American, African, and Asian studies road traffic crashes were the predominant cause. In European studies the aetiology varied, with assaults and road traffic crashes being the most important factors. In Oceania assaults were the most important. A comparison of the incidence of maxillofacial trauma of different countries together with a knowledge of different laws (seat belts for drivers, helmets for motocyclists, speed limits, and protection worn during sports and at work) is crucial to allow for improvement in several countries. To our knowledge this paper is the first attempt to study and compare the aetiologies of maxillofacial trauma.

Chapter 3 includes a review of the papers that were published during the past 30 years about the distribution and characteristics of motor vehicle accidents – related facial injuries throughout the world. All papers that were published in English between January 1980 and December 2013 using MEDLINE and the MeSH term “facial fractures” together with the term “motor vehicle” were assessed. The percentage of motor vehicle accidents as etiological factor in epidemiological studies about maxillofacial injuries ranged between 11% and 85%. On the whole, a progressively decreasing trend was observed, particularly in North America and Brazil, and Europe. Motor vehicle accidents are still one of the most important etiological factors for maxillofacial injuries. A great difference between incidence of this kind of fractures between developed countries and developing countries can be appreciated.

In **Chapter 4**, an analysis of the demographics, causes and characteristics of maxillofacial fractures managed at several European departments of oral and maxillofacial surgery over one year is discussed. The following data were recorded: gender, age, aetiology, site of facial fractures, facial injury severity score, timing of intervention, length of hospital stay. Data for a total of 3396 patients (2655 males and 741 females) with 4155 fractures were recorded. The mean age differed

from country to country, ranging between 29.9 and 43.9 years. Overall, the most frequent cause of injury was assault, which accounted for the injuries of 1309 patients; assaults and falls alternated as the most important aetiological factor in the various centres. The most frequently observed fracture involved the mandible with 1743 fractures, followed by orbital-zygomatic-maxillary (OZM) fractures. Condylar fractures were the most commonly observed mandibular fracture. The results of the EURMAT collaboration confirm the changing trend in maxillofacial trauma epidemiology in Europe, with trauma cases caused by assaults and falls now outnumbering those due to road traffic accidents. The progressive ageing of the European population, in addition to strict road and work legislation may have been responsible for this change. Men are still the most frequent victims of maxillofacial injuries.

In **Chapter 5**, the results of a European multicentre prospective study about the epidemiology of assault – related maxillofacial fractures are discussed. The following data were recorded for each patient that was victim of an assault: gender, age, etiology mechanisms, site of facial fractures, Facial Injury Severity Score, length of hospital stay. Assaults represented the most frequent etiology of maxillofacial trauma with a percentage of 39% on the whole, with values ranging between 60.8% (Kiev, Ukraine) and 15.4% (Bergen, Norway). A male to female ratio of 11.8:1 was found. Mean age was 32.2 years. Alcohol consumption was referred by 419 patients. The most frequent mechanisms of assault related maxillofacial injury were fists with 730 cases, followed by kick and fists. The most frequently observed fracture involved the mandible with 814 fractures, followed by OZM fractures and orbital fractures. Our data confirm the strong possibility that patients with maxillofacial injuries may be the victims of physical aggression, thus making maxillofacial surgeons often the first health professionals to provide care to the victims. The crucial role of alcohol in assault – related injuries has been confirmed too.

In **Chapter 6**, Bicycle-related maxillofacial injuries are discussed. As only few reports have focused on the characteristics of maxillofacial fractures sustained in bicycle accidents, the purpose of our study was to present and compare epidemiological data about bicycle-related maxillofacial injuries in two European centers between 2001 and 2010. Bicycle-related facial fractures occurred in 105 patients (79 males, 26 females) in Turin, with a percentage of 5.77 among all facial fractures, and in 103 patients (55 males, 50 females) in Amsterdam, with a percentage of 19.69. The major risk groups included young people between their first to third decades. The mandible is the most frequently involved facial bone. Among mandibular injuries the most commonly involved site was the condyle. Bicycle-related injuries must be considered an important etiological factor in maxillofacial fractures with typical patterns, such as a peculiar seasonal incidence.

In **Chapter 7**, the epidemiological data about mandibular fractures from Turin and Amsterdam were compared and discussed. Between 2001 and 2010, a total of 752 patients were admitted at Turin hospital with a total of 1167 mandibular fractures, whereas 245 patients were admitted at Amsterdam hospital with a total of 434 mandibular fractures. Mean ages were respectively 34.8 years and 32 years. The age group 20 to 29 years revealed the highest incidence of mandibular

fractures in both centers. The fractures were mainly the result of assaults in agreement with several articles in the recent literature, followed by falls.

In **Chapter 8**, the treatment of mandibular fractures in Amsterdam and Turin is compared and discussed. This study was based on 2 systematic computer-assisted databases that have continuously recorded patients hospitalized with maxillofacial fractures in Turin, Italy and in Amsterdam, the Netherlands for ten years. Only patients who were admitted for mandibular fractures were considered for this study. Between 2001 and 2010, a total of 752 patients were admitted at Turin hospital with a total of 1167 mandibular fractures not associated with further maxillofacial fractures, whereas 245 patients were admitted at Amsterdam hospital with a total of 434 mandibular fractures. At Amsterdam center, a total of 457 plates (1.5 - 2.7 mm) were used for the 434 mandibular fracture lines, whereas at Turin center 1232 plates (1.5 – 2.5 mm) were used for the management of the 1167 mandibular fracture lines. At Turin center, 190 patients were treated primarily with IMF, whereas 35 patients were treated with such treatment option at Amsterdam center. Current protocols for the management of mandibular fractures resulted to be efficient. It is difficult to obtain a uniform protocol, because of the difference of course of each occurring fracture and because of surgeons' experiences and preferences. Several techniques can still be used for each peculiar fracture of the mandible.

In **Chapter 9**, the outcomes of patients with anterior bifocal mandibular fractures are discussed, together with the timing and management of this peculiar type of trauma. From a systematic computer-assisted database that has continuously recorded patients hospitalized with maxillofacial fractures only patients admitted with anterior bifocal bilateral mandibular fractures between 2001 and 2011 were considered. Patients were contacted and they were invited to volunteer for a clinical follow up examination. Statistical analysis was performed by the Fisher exact test, and a *P* value less than .05 was considered statistically significant. Twentythree dentate patients with anterior bifocal bilateral mandibular fractures (without the presence of further mandibular fractures) were included in the study. Thirteen patients with dislocated anterior segment underwent surgical intervention within 12 hours from hospital admission in the emergency department, whereas 10 patients with nondisplaced mandibular fractures were surgically treated in the elective operating room within 72 hours. Just 3 patients underwent tracheostomy. All patients underwent open reduction and internal fixation with 2.0 mm and 2.4 mm plates via intraoral approach, except for patients with submental or submandibular facial lacerations. Anterior bifocal bilateral mandibular fractures may involve a challenging management because they can compromise the upper airway. Accurate reduction and internal fixation of these fractures have been critical to restoring form and function of the mandible. The upper airway management and securing always takes first, but a prompt surgical intervention of dislocated fractures avoided upper airways impairment.

In **Chapter 10**, the characteristics of patients with coronoid fractures treated in Amsterdam and Turin are presented and discussed. This study was based on 2 systematic computer-assisted

databases that have continuously recorded patients hospitalized with maxillofacial fractures and surgically treated in Amsterdam and Turin between 2001 and 2010. During the 10 years, 1818 patients and 523 patients with maxillofacial fractures were admitted to the two centres respectively: 21 patients (16 males, 5 females) were admitted with 21 coronoid fractures and 28 associated maxillofacial fractures. A mean age of 42.1 years was observed. The fractures were mainly the result of motor vehicle accidents, followed by assaults and falls. The most frequently observed associated maxillofacial fracture was a zygomatic fracture (13 fractures). In both centres, mandibular coronoid fractures are treated unless a severe dislocation of the fractured coronoid is observed or a functional mandibular impairment is encountered. Conservative treatment can be used, together with the open reduction and internal fixation of associated fractures. The crucial point is to prevent ankylosis, which may be prevented by correct and early postoperative physiotherapy and mandibular function.

In **Chapter 11**, the incidence of the inferior alveolar nerve (IAN) injury in mandibular fractures was investigated. Demographics, anatomic, and etiology variables were considered for each patient and statistically assessed in relation to the neurosensory IAN impairment. Statistically significant associations were found between IAN injury and fracture displacement ($p \leq 0.03$), isolated mandibular fractures ($p \leq 0.01$), and angle fractures ($p \leq 0.004$). A statistically significant association was also found between IAN injury and assaults ($p \leq 0.03$). Displaced isolated mandibular angle fractures could be considered at risk for increased incidence of IAN injury. Assaults seem to be the most important etiological factor that is responsible for IAN lesions.